

4 zones - (Fig 4-6)

SDEB * Q12 86-285553/44 * DE 3514-359-A
Motor vehicle heater and air conditioner - has air passing through
cooling condenser, followed by two-section heater separated by air
passage with air flow controlled by flaps

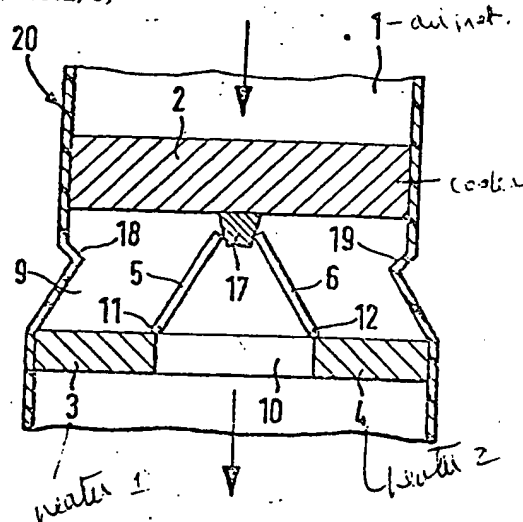
SUDDEUTKUHLERFAB J BEHR 20.04.85-DE-514359
Q74 (23.10.86) B60h-01/10 F24h-03/02

20.04.85 as 514359 (1283JW)

A housing (20) has an inlet (1) for air from a fan to a cooling condenser
(2), through which it passes to a two-part heater (3,4) on either side of
a passage (10) to the outlet.

Above the passage are two flaps (5,6), hinged at points (11,12) on
either side of the passage. The flaps swing with their free ends
between a sealing rail (17) at the centre of the condenser and
shoulders (18,19) on either side of the housing to control the air
conditioning between fully cold and fully warm state.

ADVANTAGE - Favourable air flow for both ventilating and
heating. (15pp Dwg.No.1/6)
N86-213295



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PTO 02-2298

German

Document No. DE 35 14 359 A 1

Device for Heating and/or Air conditioning
the Passenger Part of a Vehicle
[Vorrichtung zum Beheizen und/oder Klimatisieren
des Innenaums eines Fahrzeuges]

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UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D.C.

April 2002

Translated by: Schreiber Translation, Inc.

Country : Germany
Document No. : DE 35 14 359 A 1
Document Type : Patent Application laid over to
Inspection
Language : German
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IPC : B 60 H 1/10
F 24 H 3/02
Application Date : April 20, 1985
Publication Date : October 23, 1986
Foreign Language Title : Vorrichtung zum Beheizen
und/oder Klimatisieren des
Innenaums eines Fahrzeuges
English Title : Device for Heating and/or Air
conditioning the Passenger Part of a
Vehicle

CLAIMS

1. Device for heating and/or air conditioning the passenger compartment of a vehicle with a supply duct for supplied air and several duct openings that empty into the passenger compartment. It will have a heating unit with adjustable means for distribution of the through-flowing air volume [sub-volumes] blowing through the heating unit, in a through-flowing manner and/or directly to the outlet openings characterized in that the heating unit is subdivided into two sections (3,4). These are arranged at an interval next to each other in a duct segment (9) and that between themselves there is a passage opening (10) for the direct passage of air. Also, there are arranged in the duct segments, blocking elements (5,6) that block the flow to the sections (3,4) of the heating unit and the passage opening (10) or that completely or partly releases said passage.

¹Numbers in the margin indicate pagination in the foreign text

2. The device according to claim 1, characterized in that there are arranged in the duct segments (9) two distributor valves (5,6) that can be swung around axis (11,12) that are located in the area of the rims of the passage opening (10).

/2

3. The device according to claim 1 or 2, characterized in that the passage opening, (10) has at least approximately the same cross-section as the two preferably large sections (3, 4) of the heating unit.

4. Device according to one of claims 1 to 3, characterized in that separating elements (13, 14, 15, 16) are arranged in the direction of flow after section (3,4) of the heating unit and of the passage opening (10) which elements form ducts that lead to differing outlet openings.

5. Device according to claim 4 characterized in that partitions (13, 14) are arranged along the extension of the lateral rims of passage opening (10).

6. Device according to claim 4 characterized in that there is provided a partition (4) that at least approximately extends centrally to the passage openings (10) and that subdivides the passage opening (10) into two

openings in terms of width associated with which in each case a separate locking element (7).

7. Claims 4 or 6 characterized in that there is arranged a partition (16) that subdivides the discharged airflow in terms of height, adjoining the sections (3,4) of the heating unit and the passage opening (10).

8. Device according to claim 7 characterized in that the blocking elements (7,8) that are associated with the passage opening (10) are subdivided in accordance with partition (16) that subdivides the airflow in terms of height.

9. Device according to claims 1 of claims 1 to 8 characterized in that all blocking elements (5, 6, 7, 8) can be adjusted independently on each other.

/3

10. Device according to claims 1 to 9 characterized in that the blocking elements (5, 6, 7, 8) and/or their activation devices are housed on the bottoms or the water tanks of sections (3,4) of the heating unit and are preferably integrated into these sections.

11. Device according to 1 of claims 1 to 10 characterized in that the heating unit (3, 4) is equipped with the heat medium adjustment.

12. Device according to claim 11 characterized in that sections (3,4) of the heating unit can be supplied with heating medium independently of each other.

/4

The invention relates to a device for heating and/or air conditioning the passenger compartment of a vehicle with a supply duct for air that is supplied and several outlet openings that empty into the passenger compartment. It will have a heating unit and adjustable means for distributing the through-flowing air volume into sub-volumes that first of all flowed through the heating unit and/or directly blow the outlet openings.

Devices of the initially mentioned kind - such as they are known for example from DE-OS 25 30 133 [German Patent Application laid open to inspection] - are operated in various operating states. This purpose is necessary to make sure that the in-flowing fresh air after the evaporator will not be passed through only the heating unit but must also be conducted past said heating unit via a separated flow duct. A compact design for such devices is demanded in a vehicle. Therefore, for one or also for both flow paths that is to say for fresh air and warm, one needs one or several deviation devices that can only be made in a rather

favorable manner in terms of flow engineering. That increases the air resistance and thus reduces the air throughput.

In modern vehicles, temperature layering is required nowadays in the passenger compartment that is to say, the generation of different temperature values, viewed over the height of the passenger compartment. That requires a space in which one can mix warm air and cold air. In the known devices this is possible only with a relatively expensive structure. Therefore, in practice one just gets a long without any specifically targeted temperature layering. Simplified temperature layering is as a rule achieved only by supplying fewer cold air in the dash board area of the vehicle.

/5

The object of the invention is so to develop a device of the kind mentioned initially that one gets no paths that are favorably of flow engineering both for the air that is supplied, and for the warm air that is supplied so that the internal air resistance is reduced.

This problem is solved in the following manner: the heating unit is subdivided into two sections that are arranged at an interval next to each other in a duct

segment. Between themselves, leave a passage opening for the direct passage of the air while in the duct segment, there are arranged blocking elements that block or completely or partly release the influx to the sections of the heating unit and the passage opening.

With the help of this design, one can create flow paths that are favorable in flow engineering both for the cold air supply and for the warm air supply which flow paths can be used without any major deviation devices. The airside resistance of the device can thus be kept low so that one can increase the air throughput. The various operating heating and cooling can be adjusted advantageously.

Another development of the invention provides the following: separating elements are arranged in the directional flow after the sections the heating element and the passage opening and these elements form ducts that lead to the various outlet opening. In that way, one can also guide the airflow to the heating unit and the passage opening in a manner that is favorable in terms of flow.

In a first embodiment of the invention, along the extension of the lateral rims of the passage opening there are arranged partitions.

In that way, one can implement the supply of cold air during heat operations in a manner that is favorable in terms of flow.

In another development of the invention, there is provided a partition that at least approximately extends centrally to the passage opening and that subdivides the passage opening in terms of width into two openings, associated with which there is in each case a separate blocking element. In that way, one can create - a manner favorable in terms of flow - two differently tempered areas for example for the two sides of the vehicle that are cooled or heated to different values or can be supplied with fresh air in different ways. Another development of the invention provides the following: adjoining the sections of the heating unit and the passage opening, there is arranged a partition that divides the emerging airflow in terms of height. The following is also provided in addition: the blocking elements, associated with the passage opening, are subdivided in accordance with the partitions that subdivides the airflow in terms of height. By means of this design, one can on the whole, achieve four separate zones with different temperatures that is to say, two on each vehicle side, that have one temperature layering pattern regarding height.

Another development of the invention provides the following: the heating unit is equipped a heat medium adjustment. Here it is particularly advantageous when the sections of the heating units can be supplied with heating medium independently of each other. This provides further possibilities for providing different temperatures in the individual zones.

When one provides heating units that are regulated on the air sides and through which warm medium flow constantly then it is practical to provide an additional air side bypass on the heating unit.

/7

Further features and advancements of the invention will result from the following description of the embodiments and the sub-claims illustrated in the drawing.

Figure 1 is a diagram illustrating an embodiment of an invention-based device during heating operation.

Figure 2 shows the device according to figure 1 during cooling operation.

Figure 3 shows a slightly modified device according to Figures 1 and 2 with simultaneous heating and cooling.

Figure 4 shows a longitudinal profile through another embodiment of an invention-based device with a subdivision air after the heating unit in terms of height.

Figure 5 shows a horizontal profile V-V through the upper area in Figure 4.

Figure 6 shows a horizontal profile along VI-VI through the device in Figure 4 in the lower area.

The device for heating and cooling a passenger car shown in Figures 1 to 3, has housing 20 that preferably made in several parts and that preferably consist of plastic substance. In this device there are arranged an evaporator 2 of a cooling system, that is not shown in any greater detail and a heating unit that consist of 2 sections 3 and 4. The heating unit is equipped with a heating medium adjustment, not shown in any greater detail, that is to say, an adjustment that when heat is needed supplies the heating medium, preferably the coolant of an combustion engine, to the heating unit. A pure and simple heating device is abbreviated by way of modification of the illustrated embodiment. The evaporator II is omitted.

Looking in the direction of flow, housing 20 forms a supply duct 1 in front of the evaporator. This supply duct there is associated an air blower not shown that suctions the additional air that is to be supplied as fresh air out of the environment or as environmental air.

The two sections 3 and 4 of the heating unit are arranged laterally next to each other at an interval so that a passage opening 10 is left between them. The flow cross sections 3 and 4 of the heating unit and the passage opening 10 are at least approximately equal. That is to say each of section 3 and 4 and passage opening 10 displays about $1/3$ of the total cross-section. Between evaporator 1 and sections 3 and 4 of the heating unit and the passage opening 10, housing 20 forms a duct segment 9 in which are arranged as air distribution elements. These element have two air valves 5 and 6, that can be swung around vertical axes [that are hinged] upon segments 3 and 4 of the heating unit of the area of the rims of passage opening 10. Associated with air valves 5 and 6 are sealing edges 18 and 19 - that are formed by the side-walls of housing 20 - as well as a central ceiling strip 17 that adjoins evaporator 2.

By adjusting air valves 5 and 6 one can in a simple manner implement various operating states for the device. In

figure 1, the two air valves 5 and 6 are so swung that they come to rest against the central ceiling strip 17 so that passage opening 10 is blocked with respect to evaporator 2. In this position, one can get the device to implement pure heating operation. The cold device is turned off so that the evaporator 2 does not influence the in-flowing air. The heating unit with section 3 to 4 is impacted by a heating medium so that the additional air, flows through sections 3 and 4 is heated up so it become warm air. In a first embodiment, sections 3 and 4 of the heating unit are impacted evenly with the heating medium. In another embodiment, heating units 3 and 4 are impacted independently of each other with independent volumes of heating medium so that the in-flowing additional air is heated up differently through the two sections 3 and 4.

/9

In the illustration according to figure 2, air valves 5 and 6 are swung into their other terminal position, in which they rest against the ceiling edges 18 and 19 of housing 20. They block sections 3 and 4 of the heating unit with respect to additional air. The in-flow to the passage opening 10 is now completely open. In that position, one can implement fewer cooler operations where the cooling unit of the

evaporator 2 is turned on. All of the cooled additional air flows off via the passage of opening 10 between the two sections 3 and 4 of the heating unit.

When air valves 5 and 6 are in the immediate positions, which is illustrated by way of example in Figure 3 then one can implement mixed operations because the additional air flowing through evaporator 2 is subdivided over sections 3 and 4 of the heating unit as well as in the form of sub-volumes flowing through passage opening 10. As one can see in Figure 3, air valves 5 and 6 can be adjusted independently of each other. In the embodiment according to Figure 3, by way of extension of the lateral fringe of opening 10 there are arranged partitions 13 and 14 that subdivide housing 20 after section 3 and 4 of the heating unit and passage opening 10 into 3 ducts 21, 22, and 23. The 2 outer ducts 21 and 23 are used to distribute warm air to the individual air outlet openings in the area of the passenger compartment of the vehicle. The middle duct 22 that adjoins the passage opening 10, is used to distribute cold air. In this case, both the cold unit of the evaporator 2 should be turned on, and sections 3 and 4 of the heating unit could be impacted with heating medium. In this case,

one gets a simultaneous heating and cooling of the air that is supplied.

/10

Figure 4 shows a longitudinal profile through a device whose basic structure corresponds to the device according to figures 2 and 3. In the area of the evaporator 2 and the heating unit, consisting of sections 3 and 4. Housing 20 has a duct segment 9 with a flat rectangular cross-section that is bounded by the evaporator, on the one hand and the heating unit consisting of sections 3 and 4, on the other hand. As one can see from figures 1 to 3 and 4, evaporator 2 and sections 3 and 4 of the heating unit are arranged in mutually parallel preferably in vertical planes. Evaporator 2 has a larger volume and a larger flow cross-section than the two sections 3 and 4 of the heating unit together. A depression for a condensation water drain is provided in duct segment 9.

The embodiment according to figures 4 to 6, looking in the direction of flow of the in-flowing air, up to the area after sections 3 and 4 and the output opening has a structure that corresponds to figures 1 to 3. References made to the embodiments according to the figures 1 to 3 for the purpose of explaining the presiding description. Looking

in the direction of flow after passage opening 10, there is arranged a vertical partition 15 that subdivides passage opening 10 into 2 opening located next to each other. Associated with each of these openings in an air valve 7 and 8 that on the front on the partition 10 is attached with joints or hinges and that can close off the pertinent part of the passage opening 10, entirely or partially by means of corresponding adjustments.

/11

As one can see in figure 4, housing 20 is subdivided by horizontal partition 16 at the heating unit that consist of sections 3 and 4 and that are located next to each other at an interval as well as a passage opening. Looking in the direction of flow after the heating unit and passage opening 10, one gets a total of four mutually separated ducts 24, 25, 26, and 27, that are extended to differing air outlet openings. Air valves 7 and 8 are subdivided in terms of height in the area of partition 16 so that ducts 24 and 25 display air valves 7 and 8 while the subjacent 26 and 27 display 7' and 8'. All these air valves 5, 6, 7' and 8' can be adjusted individually and independently of each other. Ducts 24 to 27 are so connected with outlet opening that ducts 24 and 26 are associated with one vehicle side, while

ducts 25 and 27 are associated with the other vehicle side. Ducts 24 and 25 here lead to upper outlet openings that are roughly located in the area of the dashboard of a passenger car while ducts 26 and 27 lead to outlet openings that are located in the area of the foot space.

As one can see in Figures 5 and 6, this arrangement can be used to adjust the temperature in terms of 4 different zones assuming air valves 5, 6, 7; 8, 7' and 8' are adjusted accordingly. Figure 5 shows that by virtual the position of air valve 5, a relatively large portion of additional air is supplied through evaporator 2 and section 3 of the heating unit into duct 24. Simultaneously, cold air portion flows into duct 24 from the evaporator via passage opening 10 with air valve 7 opened. An additional air portion that is heated up to warm air flows into duct 25 from the evaporator through section 4 of the heating unit. A portion of cold air continues to flow through passage opening 10 if air valve 8 is opened. In both ducts 24 and 25 one thus finds a mixture of cold air and warm air which however due to the position of air valves 5 and 6, has different temperatures.

/12

In duct 27 that is in the lower left-hand corner of the drawing of Figure 6 there is only warm air because the area

of the passage opening 10, leading to it is closed by air valve 7'. In the lower right-hand duct 27, there is a cold air and warm air mixture at which however the cold air portion on account of the position of the air valve 8' is reduced when compared to the cold air and warm air mixture of duct 25. By virtue of the above-described position of air valves 5, 6, 7, 8 and 7', 8' one gets not only different temperatures in 4 zones but there is also a temperature layering pattern in terms of height. Duct 26 - that is associated with the left side and that leads to air outlet openings in the foot area - conducts only warm air. Duct 24 - that is also associated with the left side and that leads to the air outlet openings in the area of a dashboard - conducts a mixture of cold air and warm air so that a temperature layering pattern is set for the left area. The same applies correspondingly to the right area. Duct 26 associated with air outlet openings in the foot area conducts a mixture of cold air and warm air with a relatively large portion of warm air and a relatively small portion of cold air. Duct 26 also associated with the right side, on the other hand, conducts a mixture of cold air and warm air with a larger portion of cold air on account of a wider opening of air valve 8.

In the above it was explained that the heating unit is subdivided into two sections 3 and 4 that are arranged at an interval next to each other in terms of time [sic.] that naturally must also be so construed that two independent heating units can be provided corresponding to sections 3 and 4, which need not be assembled by any connecting elements to form one structural unit.

